# REMARKS

Claims 1-31 are currently pending in the application. By this amendment, claims 18 and 19 are amended for the Examiner's consideration. The above amendments do not add new matter to the application and are fully supported by the specification. For example, support for the amendments is provided in the claims as originally filed. Reconsideration of the rejected claims in view of the above amendments and the following remarks is respectfully requested.

## *Allowed Claims*

Applicants appreciate the indication that claims 2-4, 11-15, 28 and 31 contain allowable subject matter. Applicants appreciate the indication that claims 20-25 are allowed. However, Applicants submit that all of the claims are in condition for allowance for the following reasons.

## *35 U.S.C. §103 Rejection*

Claims 1, 16 and 26 were rejected under 35 U.S.C. §103(a) for being unpatentable over U. S. Patent No. 6,946,755 issued to Tamai et al. ("Tamai") in view of U. S. Patent No. 5,894,887 issued to Kelsey et al. ("Kelsey"). Claims 5-10, 18, 19, 27, 29, and 30 were rejected under 35 U.S.C. §103(a) for being unpatentable over Tamai in view of Kelsey and further in view of U. S. Patent No. 6,167,955 issued to van Brocklin et al. ("Van Brocklin"). These rejections are respectfully traversed.

The Examiner bears the initial burden of factually supporting any *prima facie* conclusion of obviousness. To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. MPEP §2142. Applicants respectfully submit that the applied references do not teach or suggest every element of the claimed invention.

**Tamai in view of Kelsey**

*Independent claim 1*

The present invention relates generally to a system and method for cooling motors and more specifically to a system and method for cooling linear motors of a lithographic tool or device. Independent claim 1 recites:

> A system for cooling a motor, comprising:
>
> a temperature adjusting device which adjusts temperature of a heat transfer fluid to approximately boiling temperature;
>
> a pressure device which adjusts pressure of the heat transfer fluid to maintain the boiling temperature of the heat transfer fluid at a predetermined level such that the boiling temperature remains substantially constant at the predetermined pressure as heat is absorbed by the heat transfer fluid generated by the motor; and
>
> a pump which pumps the heat transfer fluid through the temperature adjusting device, the pressure device and the motor.

No proper combination of the applied art teaches or suggests all of these features.

The Examiner asserts that Tamai discloses a system for cooling a motor using a heat transfer fluid. The Examiner admits that Tamai does not disclose regulating the pressure or temperature of the heat transfer fluid. Applicants agree that Tamai does not teach these features. The Examiner further asserts that Kelsey teaches controlling the temperature (lines 41-45 of col. 2) and pressure (lines 35-42 of col. 4) of a heat transfer fluid, and that it would have been obvious to modify Tamai to control the temperature and pressure of the heat transfer fluid. Applicants respectfully disagree.

Tamai discloses a cooling system for a linear motor. The linear motor comprises a yoke 2 that holds magnets 3. The moveable member of the linear motor comprises a frame 10 that supports an armature coil 6. The moveable member is actuated in a well known manner by applying an electric current to the armature coil 6. The application of current, however, generates unwanted heat. Thus, Tamai discloses heat pipe 7 extending between the armature coil 6 and a heat sink 11 (e.g., refrigerant passage). Heat pipe 7 comprises a tube 71 filled with heat transfer fluid, a heat absorbing part 71a that contacts the armature coil 6, and a heat radiating part 71b that contacts the heat sink 11. In this way, heat generated at the armature coil 6 is transferred away from the armature coil via the heat pipe 7. As admitted by the Examiner, Tamai does not teach or suggest a temperature adjusting device or a pressure regulating device. Moreover, Applicants submit, that Tamai does not teach or suggest a pump which pumps the heat transfer fluid through a temperature

adjusting device, a pressure device, and a motor, as recited in claim 1. Instead, Tamai uses a convection/condensation mechanism which does not require a pump.

Contrary to the Examiner's assertions, Kelsey does not compensate for the deficiencies of Tamai. Kelsey discloses a system and method for controlling the temperature of a ceramic dome of a vacuum processing chamber. The system comprises a dome 50 that is to be maintained at a uniform temperature (col. 1, lines 60-67). RF coils 30 surround the dome 50 and generate an electromagnetic field that ionizes the gases within the vacuum chamber. Band heaters 56, 57 are used to heat dome 50 when the dome temperature is below the desired temperature (i.e., "set point") (col. 4, lines 46-52). Heat pipe structure 64, on the other hand, is used to remove heat from the dome 50 when the dome temperature is above the set point (col. 4, lines 52-55). Thus, the band heaters 56, 57 and the heat pipe structure 64 strive to maintain the dome 50 at a desired temperature (i.e., set point).

In Kelsey, the heat pipe structure 64 comprises spiral tubing 78 that fluidly connects a boiling chamber 74 and a condensation chamber 76 (FIGS. 2-3). When sufficient heat is transferred from the dome 50 to the boiling chamber 74, heat transfer fluid within the boiling chamber 74 boils, thereby converting to a vapor which expands and rises through tubing 78 to the condensation chamber 76. Heat is transferred out of the vapor in the condensation chamber 76, thereby changing the vapor back to a liquid, which travels down the tubing 78 back to the boiling chamber 74. The pressure within the condensation chamber 76, tubing 78, and boiling chamber 74, can be altered using valve 84 and connection 82. This allows the user

to set the desired temperature of the dome 50, by controlling how much heat transfer is necessary to make the heat transfer fluid boil (col. 4, lines 35-42).

However, Kelsey does not teach or suggest a temperature adjusting device which adjusts temperature of the heat transfer fluid to approximately a boiling temperature, as recited in claim 1. Kelsey only teaches maintaining the dome 50 at a constant temperature, and is completely silent as to ensuring that the heat transfer fluid temperature remains at approximately the boiling temperature. Contrary to the Examiner's assertion, the following passage in Kelsey (col. 4, lines 35-42)

> The temperature at which the heat pipe maintains the ceramic dome (inside surface of the processing chamber) is set by the individual design of the heat pipe and by a built in thermostat on the heater band, as will be understood by persons of ordinary skill in the art.

actually stands for the proposition that the heat pipe maintains the temperature of the dome – not that anything adjusts the temperature of the heat transfer fluid. There is simply nothing in this passage, or in the rest of Kelsey, to suggest that the temperature of the heat transfer fluid within the heat pipe structure is adjusted to approximately boiling temperature. Moreover, there is no suggestion in Kelsey, and the Examiner does not even assert, a temperature adjusting device that causes such an adjustment in temperature.

Furthermore, although Kelsey shows a valve 84 to adjust the pressure inside the heat pipe structure 64, this valve does not adjust the pressure to maintain the boiling temperature of the heat transfer fluid at a predetermined pressure such that the boiling temperature remains substantially constant as heat is absorbed by the

heat transfer fluid, as recited in claim 1. In implementations of the invention, it is contemplated that by regulating both the temperature and pressure of the heat transfer fluid, heat generated from the motor coils will result in boiling of the heat transfer fluid but will not raise the temperature of the heat transfer fluid. Kelsey, however, makes no mention whatsoever that the pressure adjustment maintains the boiling temperature of the heat transfer fluid at a predetermined pressure <u>such that the boiling temperature remains substantially constant as heat is absorbed by the heat transfer fluid</u>. To the contrary, Kelsey explicitly states that, during operation, the temperature of the vapor increases (col. 4, lines 62-63). In fact, in the Kelsey system, the boiling temperature of the heat transfer fluid will necessarily increase as the pressure inside the heat pipe structure 64 increases due the creation of vapor. Thus, Kelsey not only fails to teach or suggest the features of claim 1, but actually teaches directly away from the claimed invention.

Lastly, Kelsey does not teach or suggest a pump that pumps the heat transfer fluid through the temperature adjusting device and through the pressure device, as recited in claim 1. The first embodiment of Kelsey, shown in FIGS. 2-5, simply does not contain a pump that pumps the heat transfer fluid. Rather, the heat transfer fluid moves back and forth between the boiling chamber strictly by way of convection and condensation (in the condensation chamber 76 and/or along wick 80).

Applicants note that Kelsey refers to the funnel-shaped wick 120 of a second embodiment, shown in FIG. 6, as a "condensate pump". However, the second embodiment does not contain the pressurization valve 84 and connector 82, and thus lacks any suggestion of pressure device which adjusts pressure of the heat transfer

fluid. Moreover, even if any wick (e.g., 80, 120, 122, 128) in any embodiment did constitute a pump, which Applicants do not concede, none of the wicks would function to pump the heat transfer fluid through a temperature adjusting device and through a pressure device, as recited in claim 1. Therefore, Tamai and Kelsey, alone or in combination, do not teach or suggest every feature of claim 1.

*Dependent claim 16*

Applicants respectfully submit that claim 16 depends from an allowable independent claim, and is allowable due to the allowability of the independent claim.

Moreover Applicants submit that Tamai and Kelsey do not show the features of claim 16. Specifically, the applied references do not teach or suggest a condenser which is downstream from the motor, as recited in claim 16.

The Examiner, in rejecting claim 16, cites lines 4-7 of column 4 of Kelsey. Applicants admit that Kelsey shows a condenser. However, there is absolutely no teaching or suggestion in either reference that it would have been obvious modify Tamai by providing the condenser taught by Kelsey downstream of the motor. Moreover, the Examiner has not even asserted as much. Therefore, the applied references fail to teach or suggest each and every element of claim 16.

*Independent claim 26*

Independent claim 26 recites:

> A method of cooling a motor, comprising the steps of:

> adjusting the temperature of a heat transfer fluid to approximately boiling temperature; and
>
> adjusting a pressure of the heat transfer fluid to maintain the boiling temperature of the heat transfer fluid at a predetermined pressure such that the boiling temperature remains substantially constant as heat is absorbed by the heat transfer fluid generated by the motor.

The Examiner admits that Tamai does not disclose adjusting the temperature and pressure of the heat transfer fluid. And, as discussed above, Kelsey does not teach or suggest adjusting the temperature of a heat transfer fluid to approximately boiling temperature. Rather, Kelsey discloses maintaining the dome 50 at a constant temperature, and is completely silent as to ensuring that the heat transfer fluid temperature remains at approximately the boiling temperature.

Furthermore, as also discussed above, Kelsey does not disclose adjusting the pressure of the heat transfer fluid to maintain the boiling temperature of the heat transfer fluid at a predetermined pressure <u>such that the boiling temperature remains substantially constant as heat is absorbed by the heat transfer fluid</u>. To the contrary, Kelsey explicitly states that, during operation, the temperature of the vapor increases (col. 4, lines 62-63). Thus, Kelsey not only fails to teach or suggest the features of claim 26, but actually teaches directly away from the claimed invention.

Accordingly, Applicants respectfully request that the rejection over claims 1, 16, and 26 be withdrawn.

**Tamai in view of Kelsey and further in view of Van Brocklin**

*Claims 5-10, 17-19, 27, 29 and 30*

As discussed above, Tamai and Kelsey do not teach or suggest all of the features of independent claims 1 and 26. Van Brocklin does not compensate for the deficiencies of Tamai and Kelsey. As such, Applicants respectfully submit that claims 5-10, 17-19, 27, 29 and 30 depend from an allowable independent claim, and are allowable due to the allowability of the respective independent claims.

The Examiner is of the opinion that Van Brocklin teaches using a valve in order to increase the versatility of a heat pipe to allow the heat pipe to be used in varying circumstances requiring different levels of heat dissipation, and that it would have been obvious to further modify Tamai by utilizing an adjustable pressure valve. Applicants respectfully disagree.

Van Brocklin discloses a heat pipe 170, 180 for an electronic device. The heat pipe 170, 180 contains a heat transfer fluid and a valve 20. The valve 20 is magnetically controlled to be either open (FIG. 2) to allow the flow of fluid within the pipe, or closed (FIG. 4) to prevent the flow of fluid within the pipe. When valve 20 is open, heat from component 40 may be dissipated via heat spreader 30. When valve 20 is closed, heat from the component 40 does not dissipate via heat spreader 30. In this manner, the heat spreader 30 can be selectively used in desired situations (e.g., when nominal heat dissipation is required and fan operation is not desired due to the noise created or the power consumed by the fan) (col. 3, lines 17-60). The valve 20 is not a pressure adjustable valve which adjusts pressure of the heat transfer fluid to maintain the boiling temperature of the heat transfer fluid at a predetermined level

such that the boiling temperature remains substantially constant at the predetermined pressure as heat is absorbed by the heat transfer fluid, as required by the combination of claims 5 and 1. Van Brocklin simply makes no mention of valve 20 functioning to adjust pressure of the heat transfer fluid to maintain the boiling temperature of the heat transfer fluid at a predetermined level. In fact, quite the opposite occurs. When valve 20 is open, it has no effect on the pressure of the heat transfer fluid. When valve 20 is closed, it causes the pressure of the heat transfer fluid to rise when heat from the component 40 boils the fluid (col. 4, lines 49-54). As such, valve 20, when closed and causing a pressure increase, necessarily operates to increase the boiling temperature of the heat transfer fluid. Therefore, the applied references, alone or in combination, do not teach or suggest every feature of the claimed invention.

Furthermore, as discussed below, Applicants submit that the applied references do not teach or suggest many of the features of dependent claims 6-10, 17-19, 27, 29 and 30.

For example, the applied references do not teach or suggest that the pressure device is an adjustable pressure valve that is actively controlled to maintain the predetermined pressure to ensure that the heat transfer fluid temperature remains at approximately the boiling temperature, as recited in claim 6. Contrary to the Examiner's assertion, Kelsey does not teach or suggest active control of an adjustable valve at lines 35-42 of column 4. Instead, Kelsey discloses that the set point (i.e., desired operating temperature) of the dome can be set by increasing or decreasing the pressure inside the heat pipe structure. Thus, Kelsey only teaches

maintaining the dome 50 at a constant temperature, and is completely silent as to actively controlling the valve to ensure that the heat transfer fluid temperature remains at approximately the boiling temperature.

Additionally, the applied references do not teach or suggest a temperature feedback loop which monitors and adjusts the temperature of the heat transfer fluid, as recited in claims 8 and 10. Contrary to the Examiner's assertion, Kelsey, at lines 41-45 of column 2, discloses that the design of the heat pipe maintains the dome at the desired temperature. However, Kelsey does not teach or suggest a temperature feedback loop which monitors and adjusts the temperature of the heat transfer fluid.

Moreover, the applied references do not teach or suggest a pressure feedback control device which monitors and adjusts the pressure of the heat transfer fluid, as recited in claim 10. There simply is no mention of such a device in any of the applied references.

Applicants note that the Examiner has failed to assert that the applied references teach or suggest the features of claim 19. In any event, the applied references do not teach or suggest that the heat transfer fluid is a coolant that has a boiling temperature less than ambient temperature at atmospheric pressure, as recited in claim 19.

Even further, the applied references do not teach or suggest actively controlling the pressure of the heat transfer fluid to maintain the predetermined pressure to ensure the heat transfer fluid temperature remains at approximately the desired boiling temperature as it passes through the motor, as recited in claim 28. As discussed above, contrary to the Examiner's assertions, Kelsey only discloses

striving to control the temperature of the dome, and does not teach or suggest actively controlling the pressure of the heat transfer fluid.

Additionally, the applied references do not teach or suggest providing a feed back which monitors and adjusts the temperature of the heat transfer fluid and monitors and adjusts the pressure of the heat transfer fluid such that the boiling temperature of the heat transfer fluid is maintained, as recited in claim 30. The applied references simply do not disclose such feedback features.

Accordingly, Applicants respectfully request that the rejection over claims 5-10, 17-19, 27, 29 and 30 be withdrawn.

***Other Matters***

Claims 18 and 19 have been amended to address grammatical errors that have come to Applicants' attention, and not for reasons related to patentability.

## CONCLUSION

In view of the foregoing amendments and remarks, Applicants submit that all of the claims are patentably distinct from the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue. The Examiner is invited to contact the undersigned at the telephone number listed below, if needed. Applicants hereby make a written conditional petition for extension of time, if required. Please charge any deficiencies in fees and credit any overpayment of fees to Attorney's Deposit Account No. 19-0089.

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